Health Consultation

Montesano Tar Pit
Montesano, Grays Harbor County, Washington

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Prepared by
Washington State Department of Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Foreword

The Washington State Department of Health (DOH) has prepared this health consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services, Public Health Service. The mission of ATSDR is to prevent or mitigate adverse human health effects and diminished quality of life resulting from exposure to hazardous substances in the environment. This health consultation was prepared in accordance with ATSDR methodology and guidelines.

Health consultations provide advice on specific public health issues which may occur as a result of an actual, or a potential human exposure to a hazardous material. Health consultations represent a response to a specific question or a request for health information pertaining to a hazardous substance or hazardous waste sites. Health consultations often contain a time-critical element necessitating a rapid response, and therefore, represent a more limited response than a traditional public health assessment.

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Glossary

Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Aquifer	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
Contaminant	Any chemical that exists in the environment or living organisms that is not normally found there.
Dose	A dose is the amount of a substance that gets into the body through ingestion, skin absorption or inhalation. It is calculated per kilogram of body weight per day.
Exposure	Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short term (acute) or long term (chronic).
Groundwater	Water found underground that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater often occurs in quantities where it can be used for drinking water, irrigation, and other purposes.
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Indeterminate public health hazard	Sites for which no conclusions about public health hazard can be made because data are lacking.
Model Toxics Control Act (MTCA)	The hazardous waste cleanup law for Washington State.
Organic	Compounds composed of carbon, including materials such as solvents, oils, and pesticides which are not easily dissolved in water.

Parts per billion (ppb)/Parts per million (ppm)	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE.
Plume	An area of contaminants in a specific media such as groundwater.
Reference Dose Media Evaluation Guide (RMEG)	A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a *comparison value* used to select contaminants of potential health concern and is based on EPA's oral reference dose (RfD).
Risk	The probability that something will cause injury, linked with the potential severity of that injury. Risk is usually indicated by how many extra cancers may appear in a group of people who are exposed to a particular substance at a given concentration, in a particular pathway, and for a specified period of time. For example, a 1%, or 1 in 100 risk indicates that for 100 people who may be exposed, 1 person may experience cancer as a result of the exposure.
U.S. Environmental Protection Agency (EPA)	Established in 1970 to bring together parts of various government agencies involved with the control of pollution.

Background and Statement of Issues

The Washington State Department of Health (DOH) prepared this health consultation to evaluate the public health significance of potential exposure to contamination associated with the Montesano Tar Pit (MTP) site located in Grays Harbor County, Washington.

The MTP site is located in a rural setting at 254-19 Mont-Elma Highway (Figure 1), two miles east of Montesano, Washington.[1] The MTP was reportedly an open trench (containing oily/tarry material), approximately 10 feet wide, eight feet deep, and 1320 feet long running parallel to a railroad spur (Figure 2). The south end of the tar pit is located within 20 feet of U.S. Highway 12.[2] The railroad spur was operated by Schafer Brothers Logging Company from the late 1800s until the early 1930s.[2] The railroad spur ceased operation in 1948 and the rails and ties were dismantled.[3] The source of the tar material contained in the trench is most likely Bunker C Fuel oil which was used as a source of fuel for locomotives on logging railroads in the early 1900s.

On October 30, 1991, the Department of Ecology (Ecology) conducted an investigation of the site in response to a complaint regarding potential improper disposal of crude oil.[4] The landowner also indicated that he was concerned about the water quality of his domestic well.[5] The complaint investigation resulted in the MTP site being listed on Ecology's Site Management Information System (SMIS), a recommendation for further environmental characterization via a Site Hazard Assessment (SHA), Environmental Protection Agency (EPA) notification of the site for potential listing on the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) database, and also potential follow-up with the EPA removal program.

In April 1993, a Preliminary Assessment (PA) was conducted for the MTP site by URS consultants for EPA.[2] The purpose of the PA was to determine the potential for release of contaminants into the environment, and to evaluate the need for additional site investigation.[2] It was noted that portions of the property were covered by small trees and brush, large amounts of organic debris, railroad ballast, and two patches of tar were visible. The area was also reported to be semi-swampy.

During April 1995, a Site Hazard Assessment (SHA) field investigation was conducted for Ecology at the MTP site by SAIC.[3] The purpose of the SHA was to provide preliminary characterization of site contamination and gather sufficient data for scoring the site using the Washington Ranking Method (WARM) Model. As part of the field investigation of the MTP site, samples were collected from an on-site domestic well, on-site surface water, soil adjacent to the tar pit, and from tar pit material.

The MTP site received a quantitative hazard ranking of one (by Ecology) according to the WARM model during July 1995. Hazardous waste site hazard rankings are based upon a scale of one to five, with one representing the highest level of concern relative to other sites.[5] Sites that are prioritized as a one receive the highest priority for site cleanup by Ecology. The WARM model is specified by the Washington State Model Toxics Control Act (MTCA) regulation. In

1999, the estimated population of Grays Harbor County was 67,700 and the total population of Montesano was estimated to be 3,580.[6] The City of Montesano provides drinking water from a supply well located approximately four miles west of the MTP site. The residential population within one mile of the MTP site is approximately 800 individuals.[2]

Discussion

There have been no community health concerns reported to the Grays Harbor County Department of Public Services or Department of Ecology (Ecology) regarding the MTP site since the initial complaint in 1991. The potential exists for human exposure to contaminated groundwater, on-site surface/subsurface soils, surface water runoff, and on-site tar pits. Contaminants present in on-site tar pits and on-site soils may leach from the upper soil layers through sub-surface soils and may impact shallow groundwater.

Tar Pits

Early environmental investigations of the MTP site suggested the tar pit was once a well-defined continuous open trench (Figure 3) ten feet wide, eight feet deep, and approximately 1,320 feet long.[7] Based upon these dimensions, it was estimated that the amount of tar material on-site was approximately 105,600 cubic feet, including an estimated volume of 13,200 cubic feet of contaminated soil.[8] Observations made during the site visit did not correlate with a defined trench of this magnitude.

The most recent investigations of the MTP site indicate four distinct tar pit areas (numbered one through four) on-site (Figure 4). Refer to Table #1 in the Appendix for estimated volumes of the four tar pits based upon field observations. In general, the surface area of each tar pit increases from north to south.[3] The estimated dimensions of the tar pits are considered minimum amounts as additional soil contamination may exceed the visibly contaminated and odorous soil used to determine pit dimensions.[3]

Analysis of tar pit material indicated the presence of unusually high levels of Total Petroleum Hydrocarbon (TPH)-Diesel, 2-methylnaphthalene, chrysene, pyrene, phenanthrene, and fluorene. Refer to Table #2 in the Appendix for a listing of contaminant concentrations detected in tar pit material collected from both the north and south tar pits of the MTP site (Figure 4).

All four tar pits are accessible to trespassers. The two northern tar pits (#3 and #4) are small, difficult to notice, and contain large amounts of soil and plant debris (Figure 5).[3] These two tar pits are situated among somewhat dense forest, and are both stable enough to support the weight of a child or adult without sinking into the tar material.[3] However, the two southern pits (#1 and #2) are both larger and more apparent (Figure 6). Due to the elevated concentrations of TPH-Diesel and strong diesel odor, tar pit materials are thought to consist of a form of diesel fuel. High viscosity tar material also suggests that heavy petroleum oil such as Bunker C or lubricating

oil were disposed of on-site.[3] The depth of the southern pits (#1 and #2) and the presence of pure product suggest these excavated areas may have been used as a waste disposal site.[3]

The MTP site is fenced on the south and west, but is accessible to trespassers via the north and east end of the site (Figure 4). Tar pit #2 represents a physical hazard for becoming entrapped in tar, and pit #1 is covered by dense vegetation which reduces the potential physical hazard.[3] Although there is currently access to the site from the north, undergrowth and vegetation are very predominant, making access very difficult.

TPH is measured as the total quantity of hydrocarbons in an environmental medium without identification of individual constituents. The environmental fate of TPH is based upon the partitioning of the major hydrocarbon fractions.[8] Following release of TPH into the environment, changes occur in the composition of the hydrocarbons. Lower molecular weight hydrocarbons tend to have high vapor pressures, water solubilities, and tend to volatilize into the air, dissolve into groundwater and migrate away from the release area and bio-degrade.[9] The larger molecular weight TPH compounds tend to sorb to soil and persist at the site of release.

Analysis of tar pit samples indicated high levels of polycyclic aromatic hydrocarbons (PAHs) which included: 2-methylnaphthalene, chrysene, pyrene, phenanthrene, and fluorene. Refer to Table #2 in the Appendix for chemical concentrations of PAHs in tar pit material. The environmental fate of PAHs depends upon how easily they dissolve in water, bind to soil, or evaporate into the air. In general, PAHs do not dissolve easily in water.[9] Certain PAHs evaporate into the atmosphere from surface waters but usually settle to the bottom of rivers and lakes. PAHs bind to soil particles and also have the ability to leach through soils and contaminate groundwater. PAHs have been detected in groundwater as a result of migration from contaminated surface water and soil. Fluorene has been demonstrated to migrate directly through sand and clay to contaminate groundwater.[9]

Groundwater

Exposure to potentially contaminated groundwater is associated with the use of contaminated wells. The nearest on-site domestic well (16 feet deep) is located within approximately 800 feet west of tar pit #1 (Figure 4). During the 1995 SAIC investigation, two groundwater samples were collected from the tap of an on-site well and contamination was not detected in either sample. According to the PA conducted for the MTP in 1993, there are 26 domestic wells within a one-mile radius of the MTP site and six domestic wells located within a quarter-mile radius of the site.[2] The nearest downgradient domestic wells are located approximately 700 feet south of tar pit #1 and #2 and the general shallow groundwater flow of the shallow aquifer is in a southern direction. It is likely that a plume of petroleum contamination in shallow groundwater exists downgradient of the site.[10]

According to the SAIC report, well logs from the area demonstrated a repeatable pattern of lithology and water bearing zones. The report indicated that 18 well/boring logs within a half-mile radius of the site, and static water levels were from 7 to 20 feet below ground surface.

On-site Surface/Subsurface Soils

According to the PA for the MTP site, there are 3,870 individuals residing within one mile of the site and six residents live within 800 feet of the site.[2] The site is accessible via trespass, but access is difficult due to dense vegetation, thick brush, and standing water much of the year. Contaminated sub-surface soil may be exposed if contaminated areas are excavated. Two soil samples were composited and analyzed for semi-volatile organic compounds and total petroleum hydrocarbons (TPH-Diesel and TPH-Gasoline). Soil sample results indicated the presence of TPH-D at a maximum concentration of 77 ppm five feet from the southern tar pits.

Surface Water Run-off

Because of the fairly flat topography large portions of the site area are highly saturated or covered with standing water during the rainy season.[2] During site visits tar pits were observed to be under standing water. Contaminants present in tar materials can be distributed around the MTP site as well as off-site via surface water run-off. Tar pit #1 is located approximately one-mile north of the Chehalis River system. There are two drain culverts that run under Highway 12 and are reportedly one foot above the MTP site. In the event that surface water migrated off-site it would ultimately enter the Chehalis River via Bone Creek (a one-mile long creek) located a quarter mile from the southern most tar pit #1. Surface water was sampled from a pond approximately five feet away from the southern most tar pit.[3] Two samples were collected, the first was screened for TPH-D and TPH-G, and the second was sampled for semi-volatile organic compounds.

ATSDR Child Health Initiative - Analysis of Exposure Pathways and Children

ATSDR and DOH recognize the unique vulnerability of infants and children, and that they require site-specific evaluation regarding exposure to environmental contaminants. Infants, children, and unborn fetuses may be at greater risk for potential exposure and adverse health effects compared to older children or adults. Children are more likely to engage in outdoor activities which put them into direct contact with contaminants in soil. Frequent hand-to-mouth activities account for increased exposure in young children via ingestion and dermal contact.

Pound-for-pound body weight, children drink more water, eat more food, and breathe more air than adults. Within the United States, children within the first six months drink seven times as much water (per pound) than the average adult.[11] As a result, because of the unique characteristics of children, given the same level of exposure, children receive a significantly higher contaminant dose than adults. For the purposes of this health consultation, children are defined as the period from conception to maturity at 18 years of age, when all biological systems have matured.[11]

Individuals using private wells (located downgradient of the MTP site) may have been exposed to contaminants in groundwater. There is potential for trespassers to become exposed to

contaminants present on on-site soils. However, under existing site conditions it would be unlikely that children would come into contact with on-site soils due to the amount of dense ground cover and brush surrounding the site.

Conclusions

Environmental investigations have indicated the presence of contamination at the MTP site. Based upon review of limited environmental monitoring data, the MTP site poses an indeterminate public health hazard. Additional characterization of the extent of contamination is necessary to adequately evaluate the public health implications of potential exposure to contaminated groundwater (on-site and off-site) and exposure to contaminated on-site soils. In addition, surface water run-off from the on-site tar pits represent a potential exposure pathway requiring further evaluation.

Human exposure to on-site contamination may occur via ingestion of contaminated groundwater from downgradient domestic wells. The 1993 PA for the MTP site indicated six domestic wells were located within a quarter-mile radius of the MTP site serving an estimated population of 21 individuals.

The MTP site is fenced on the west and south, but is accessible to trespassers via the north and east end of the site. There is an estimated population of 3,870 individuals residing within one mile of the site. Therefore, the potential exists for exposure to contaminated on-site surface and subsurface soils. However, this is not considered to be a reasonable exposure scenario due to the very dense vegetation surrounding the tar pits.

Tar pit #1 and #2 poses a public health hazard since the potential to become entrapped in tar poses a physical hazard.

Recommendations/ Public Health Action Plan

1. Determine the current number of domestic wells located downgradient of the MTP within one-quarter mile (1320 feet) of the site.

2. Monitor selected domestic wells downgradient of the MTP site to determine if contamination is migrating off-site and affecting domestic groundwater users.

3. Secure or excavate the northern tar pits #3 and #4.

4. Secure or excavate the southern tar pits (#1 and #2) on the MTP site to prevent trespass and eliminate the physical hazard posed by the tar pits.

References

1. Washington State Department of Ecology Complaint Investigation Report prepared for Montesano Tar Pit by Russell Post. November 26, 1991.

2. Preliminary Assessment Report for Montesano Tar Pit prepared by URS consultants under contract 68-W9-0054. April 29, 1993.

3. Science Applications International Corporation (SAIC) Montesano Tar Pit Interim Report. February 22, 1999.

4. Washington State Department of Ecology Complaint Investigation Report prepared for Montesano Tar Pit by Russell Post. November 26, 1991.

5. Washington State Department of Ecology Site Hazard Assessment Memorandum from Michael Spencer to Virgil Foster. July 24, 1995.

6. State of Washington, Office of Financial Management Forecasting Division. April 1, 1999 Population of Cities, Towns, and Counties. June 30, 1999.

7. Washington State Department of Ecology Memorandum from Tammy Hall to Kathy Gerla regarding Virgil Foster property. March 4, 1998.

8. Agency for Toxic Substances and Disease Registry Toxicological Profile Update for Total Petroleum Hydrocarbons (TPH). Atlanta, Georgia: September 1999.

9. Agency for Toxic Substances and Disease Registry Toxicological Profile Update for Polycyclic Aromatic Hydrocarbons (PAH). Atlanta, Georgia: August 1995.

10. Science Applications International Corporation (SAIC) Montesano Tar Pit Interim Report. February 22, 1999.

11. Agency for Toxic Substances and Disease Registry. Guidance on Including Child Health Issues in Division of Health Assessment and Consultation Documents. July 2, 1998.

Appendix

Insert Figure 1

Insert Figure 2

Insert Figure 3

Insert Figure 4

Insert Figure 5

Insert Figure 6

Table 1. - Estimated Volume of Tar Pits					
Tar Pit #	Location	Surface Area (sq ft)	Estimated Depth of Contamination (feet)	Calculated Volume of Contaminated Soil (cu ft/cu yd)	
1	South Pit	1000	7	7,000	260
2	South Pit	300	10	3,000	110
3	North Pit	175	3	530	20
4	North Pit	52	3	160	6

Table 2.- Maximum Contaminant Concentrations in Tar Pit Material					
	E & E August 1993		SAIC July 1995		
Contaminant	**Concentration**	**Location**	**Concentration**	**Location**	
Chromium	18 ppm	North Pit	NA		
Copper	8 ppm	North Pit	NA		
Nickel	60 ppm	South Pit	NA		
Zinc	17 ppm	North Pit	NA		
Total Xylenes	8 ppm	North Pit	NA		
2-Methylnaphthalene	570 ppm	South Pit	420 ppm	South Pit	
Phenanthrene	470 ppm	South Pit	290 ppm	South Pit	
Pyrene	190 ppm	South Pit	110 ppm	South Pit	
TPH-Diesel			190,000 ppm	South Pit	
Chrysene			100 ppm	South Pit	
Fluorene			110 ppm	South Pit	

Certification

This Montesano Tar Pit Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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